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Designing for Learning and Play: The Smiley Model as a Framework

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Abstract: This paper presents the Smiley Model as a framework for designing engaging learning experiences in games. In a design-based research project, student game designers learned inside a gamified learning design while designing and implementing learning goals from curriculum into small digital games. Project participants were adult students in an upper secondary general education program. The Smiley Model inspired and provided a scaffold or a heuristic for the overall gamified learning design and for the students' learning game design processes, turning the learning situation into an engaging experience while integrating learning and play.¹ The student game designers reached cognitively complex levels of understanding by designing learning situations into the digital learning games. They experienced motivating learning situations, and the social and collaborative learning processes in the class increased.

Keywords: Engaging learning experiences, game design model, learning game design, playful education, students as learning game designers.

1 Learning through Playful and Gameful Experiences

'Ultimately game design is play design. The rules of a game are relevant because they facilitate the experience of players' [1; p. 299]

The need for knowledge about how to motivate students to learn is not new [2]. However, the problem is highly relevant, as it is becoming increasingly difficult to motivate and engage young people [3]. The motivation to learn has an effect on the quality of students' results in school as well as on their ability to complete their education. Many young

¹ The theoretical description of the Smiley Model was adapted from the author's 2016 PhD thesis [4].

people lose the motivation to stay in school, which leads to absence and dropping out. New knowledge is needed about what enables students' motivation to learn, and researchers suggest that we need more knowledge about how the motivation to learn can be enhanced through the educational system [3].

Numerous educational experiments have been conducted to investigate the possibility of engaging students in the learning process by 'borrowing' engaging and playful elements from games. The purpose of using games for learning is to create motivation and variety in the classroom, but many scholars have also argued for using learning games in education as a potential means of learning [5, 6, 7, 8].

Learning-game designers generally aim to design games that trigger learning and deeply motivate students [9]. Learning games are often designed to provide learning trajectories for the learner/player. For example, learners/players may be encouraged to identify with the game characters' roles and are given assignments as a means of guiding the learner through the learning process. In many learning games, principles of learning are built into the games to empower learners, teach them problem solving and enable understanding of the subject matter [9]. Students can choose to follow their own storylines by making in-game choices. By becoming familiar with the problems, tools, experiences, perspectives and consequences in the learning environment's gameplay, learners presumably develop a richer understanding of the subject matter being taught [5].

Small Digital Games: Game design as a means of learning. To deeply engage students in the learning process, this project went one step further than using ready-made learning games. The project experimented with an innovative learning design: having students create learning games, embedding curricular learning goals within their created games, as a means of learning. The purpose of this experiment was to effectuate *learning while playing learning games* in the very learning processes taking place as students themselves designed games for learning. Student learning-game designers would then consider and construct similar processes within their own games. For example, the students at VUC Storstrøm learned about the American Civil War and human rights by creating a variety of digital learning games. They used original sources from the Library of Congress to inspire the creation of game narratives that involved various learning paths for the students who would eventually play the games.

Gamified learning design: In addition to inviting students to work with the creative game design process, the project aimed to scaffold and evaluate the learning process through an overall gamified learning design for the student game designers and to facilitate the learning process for the potential game players. Several schools have worked with *gamifying* (applying game elements to non-game environments; [10]) their curriculum for different age groups and for different lengths of time. For example, Quest to Learn, a public school in New York, has a pedagogical strategy that aims to transform the learning experience by using the underlying structure of games as the foundation for its curriculum [11]. Gamification was also undertaken in the current project; the learning game design assignments were presented for the students as tasks in a 'big Game', that is, an overall gamified learning design [12]. The *overall gamified learning design* can be characterised as the learning and play situations that were designed for and emerged

around the process of creating small learning games as students discussed, negotiated, developed and decided what to design next inside the learning games.

When seeking to create motivating and efficient learning environments for students and teachers, it can be a challenge to find a balance between facilitating learning processes at high levels of cognitive complexity [13] and creating playful and engaging experiences for students and teachers [14]. This challenge is relevant for teachers in their daily planning processes as they seek to create motivating learning experiences through their student learning designs. The challenge was also relevant in this experiment, both as students created learning environments inside their small digital learning games and in the creation of the overall gamified learning design [12]. The desired balance is lost if the learning processes are great fun but shallow, reflecting a low level of cognitive complexity [15]. Conversely, a game may facilitate good learning processes and many learning activities but result in low motivation among students because it is considered boring.

The difficulty in aligning learning situations with playful situations reflects a difference in focus between learning designers and game designers [16]. For learning designers (teachers), learning goals and learning processes are given high priority. Learning goals may be secondary for game designers, who tend to prioritise engaging gameplay [17]. This represents two systems with two different aims: learning and play. However, as numerous studies have shown, play and learning are deeply interconnected [18]. As game designer Raph Koster stated, 'Fun in games arises out of mastery, it arises out of comprehension. It is the act of solving puzzles that makes games fun. With games, learning is the drug' [19].

The following research question guided the analyses: Can the Smiley Model be used as a supportive framework when designing engaging learning experiences? The aim was to investigate whether a framework that integrated learning and play would support students in acquiring new knowledge and skills at a cognitively complex level of understanding and also support the creation of playful, engaging and motivating learning experiences. The article describes and analyses how this particular framework—the Smiley Model—was used 1) to design playful and gameful learning situations in a gamified learning design, and 2) to support the design process of small digital learning games in a way that created meaningful and cognitively complex learning processes for the student game designers.

The article describes and analyses how the theoretical constructs in the Smiley Model were used as a supportive framework for designing engaging learning experiences both in the big gamified learning design and in the small digital games designed by the students. The elements from the Smiley Model are introduced individually and in detail; this allows readers to thoroughly evaluate the model and find possible inspiration for the creation of new learning designs. Following the introduction of each theoretical construct, the paper will analyse how it was designed into and used within the project, first for the overall gamified learning design and then for the small games (small digital games created by the students).

2 Methodology

Approach, Data Collection and Analysis: The investigation used mixed methods and was conducted as a design-based research (DBR) study through three iterations over two years (Spring 2014 to Spring 2015). The teachers and students were co-designers in the development and test process. Semi-structured interviews were conducted with teachers after each workshop and with students after the final workshop. All workshops were observed, and actions and utterances were audio- and videotaped. Data included field notes, evaluation documents written by the students, questionnaires, videos of students' games being discussed and play tested and the students' digital games themselves. The analysis was performed by coding the transcribed data using the qualitative research software NVivo with an informed grounded theory approach [20]. The analysis was carried out as concept-driven (using concepts from the theory and previous empirical data to find themes in the data) and data-driven (reading the data and searching for new phenomena which are not known from previous preconceptions of the subject) [21].

Participants and Framework conditions: In the main iterations, the first and third, the audience comprised adult students from two upper secondary general education program classes at VUC Storstrøm, an adult learning centre in Denmark. These students were participating in a full-time, two-year education, and building games supported learning the curriculum. In the second (smaller) iteration, the audience comprised 7th grade students. In this class, the students were studying creative use of IT but were still building the games to meet specific learning goals. The second iteration experimented with a specific component of the overall learning design: helping students understand the concept of a learning design by tasking them with implementing learning into games of their own creation. This article primarily focuses on the findings from the third iteration, which incorporated the lessons learned from the DBR project's previous two iterations.



Fig. 1. Students designing analogue learning game concepts and digital learning games.

Research Design: In this project, student game designers were learning inside a gamified learning design while designing small digital games. These game experiments were used to explore whether it was possible to create motivating and cognitively complex learning experiences for adult upper secondary students. The aim for the overall gamified learning design was to let the students act as their own learning designers by integrating relevant

academic subject knowledge into small analogue games that then were transformed into digital games (Fig. 1).

The plan of the learning design was that while building and implementing learning goals into the small games, the would students discuss, negotiate, and finally master these intended learning goals in active, collaborative, constructionist, problem-based and motivating learning approaches. Furthermore, the learning goals would be addressed in the playtests that student teams carried out with other student teams. By examining the academic knowledge, the students would become reflective about the academic knowledge, becoming academically proficient as a result. Their fellow students should subsequently learn from playing the games, gaining knowledge, skills and competence while playing. This was an ambitious goal, since a good *learning-game-play* is difficult to achieve even for trained learning game designers and instructors [22]. Since it could become difficult for the students to build good learning games, the focus of the overall learning design was on the learning that took place in the big Game—the overall gamified learning design.

The Smiley Model inspired and provided a scaffold for the big Game as well as for the students' learning game design process, during which they implemented learning goals from curriculum into the small digital games. Figure 2 outlines the structure of the learning design.

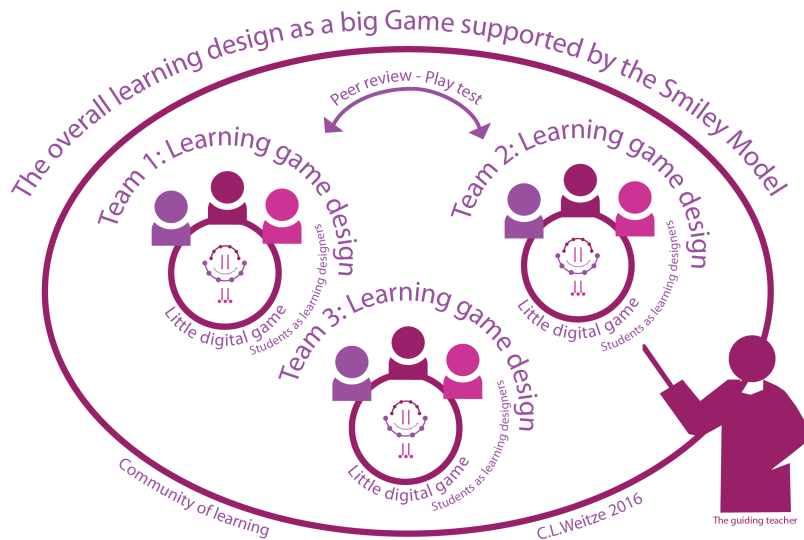


Fig. 2. The gamified learning design. The model has been inspired by the author's previous work [15, 55], but has been altered based on the experiences from the current project.

In all iterations, students were divided into teams that competed and collaborated. There were 25 levels of assignments presented to the teams in Google Docs documents. Each team developed its learning game concepts by following the instructions in the overall gamified learning design described in these documents. Students were guided through a paper prototype phase followed by a software development phase as they conceptualised and developed their small learning games (Fig. 1). The students brainstormed to create game narratives that could encompass their chosen learning goals and documented their explicit learning goals for the individual games. In the third iteration, the students implemented learning goals from the subjects of history and English as a second language (ESL). This process was carried out in three five-hour workshops.

3 The Smiley Model

The Smiley Model (Fig. 3) is a learning game design model for building engaging learning games. The author constructed the model in a previous project which aimed to create a theoretical model that could support the learning game design process—balancing learning and play—when elaborating a conceptual design for a digital music learning game [23, 24]. The Smiley Model combines learning design and game design—learning and play. It is a theoretical model that addresses 1) how to design learning processes and 2) how to implement learning elements into a game, while also considering 3) how to make the game motivating and engaging. Many other models have been suggested as frameworks for designing learning games [25, 26, 27, 28]; all share common elements, as each focuses on learning and engagement/motivation/play. But there are also differences which enable the various models to support specific components of the learning game design process. Furthermore, the suggestions for how to apply the models vary and can be relevant for different learning environments.

The Smiley Model uses a framework for learning design (Hiim and Hippe's learning design model [29]) which encompasses designing for students' learning prerequisites, the framework conditions or learning situation, the learning goals, the content and the creation of relevant learning processes and evaluation processes. The framework is accompanied by six game design elements that are used to set the learning design into play: game goals, action space or narrative, rules, choices, challenges and feedback. Each of these game elements is intertwined with the others. The Smiley Model thus addresses the need to design the learning process, the need to set the learning elements into play through traditional game-elements and the need to design for motivational factors. In prescribing how best to 'set the learning into play', the Smiley Model advises keeping in mind and designing for Bruner's [30] three primary driving forces for our intrinsic motivation to learn: 1) curiosity, 2) the feeling of achieving competence and 3) reciprocity.

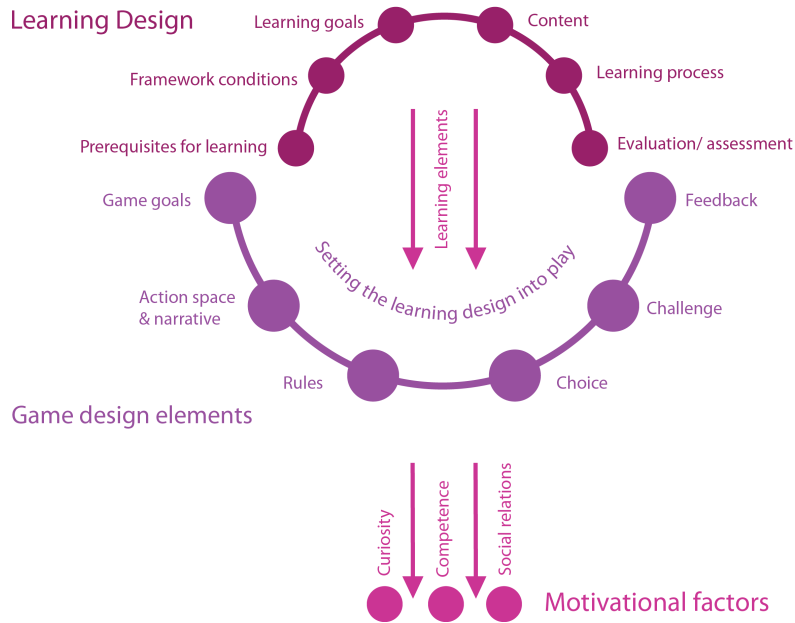


Figure 3: The Smiley Model - a learning game design model for building engaging learning games. The model has been inspired by the author's previous work [23, 24], but has been altered based on the experiences from the current project.

4 The Affordances of a Learning and Game Design Framework: Theoretical and Empirical Findings

Because the design of learning games is a complex process even for experienced learning game designers [22], the Smiley Model was used to scaffold and support students and teachers during the learning design and game design process. The concepts from the model were used to formulate questions about learning goals, learning processes, learning activities, etc. The student teams answered questions and solved tasks regarding the creation of playful experiences for their fellow students in the small games by producing game goals, narratives, rules, choices, challenges and feedback. They also focused on ways to motivate and engage fellow students by sparking their curiosity and instilling a sense of competence in their achievements within the games.

4.1 Learning Design

This section describes the learning design, or the ‘upper-arc’ in the Smiley Model (Fig. 3), and describes and analyses how this learning design was used in the project.

Learning theorists Hiim and Hippe’s didactical relationship model [29, 31] is a student-centred learning design model that emphasises the influence of context on the student’s learning processes. In this model, learning is designed through an interplay between six elements: 1) the student’s prerequisites for learning (learning qualifications); 2) the framework conditions for the teaching/ learning situation; 3) the learning goals; 4) the educational content (curriculum and subject); 5) the learning process; and 6) the need for evaluation of learning. These six elements should be taken into consideration when a teacher plans and designs for learning and carries out teaching (Fig. 4) [29, 31].

The research project used Hiim and Hippe’s [29, 31] learning design model as a framework to design and investigate learning processes (Fig. 4). This relationship learning design model is dynamic; the idea is that one parameter cannot be changed without affecting the others. For example, in the overall gamified learning design, the choice of game design as a teaching medium (*framework conditions*) sets requirements for the learning activities when the teacher is designing for and facilitating the *learning process*. That learning process should change according to each student’s *prerequisites for learning*, in terms of both innate and acquired skills, in order for each student to be able to meet the learning goals.

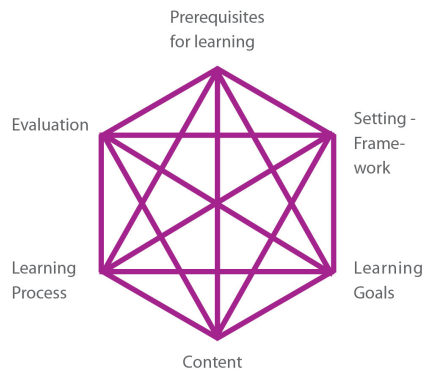


Fig. 4. Didactical relationship model - a learning design relationship model [31].

The following section discusses the six elements of Hiim and Hippe’s didactic relations model one-by-one, providing a description and analysis of each element’s application in this project, first in the context of the big Game and then in the context of the small games.

1) *Student’s prerequisites for learning/learning qualifications.* This refers to the mental, physical, social and professional opportunities and barriers the student may experience in various areas in relation to the current teaching [29 p. 134]. It is important

to try to clarify each student's learning qualifications. What prior knowledge can the learner be expected to have, or what knowledge must the learner have, to reach the learning goals and be a successful learner? Which things interest and motivate the student? What is the student's reason for attending classes? Does the student have specific problems? What can be said about this target group in general? After mapping these learning prerequisites, the teacher has the opportunity to differentiate his or her teaching in relation to each student.

Prerequisites for learning in the gamified learning design: Attended mainly by young adults, VUC can be described as a 'second chance' for many of its students. The student population at VUC is diverse; students' academic, social and personal backgrounds vary widely, which can be challenging for teachers. Sixty percent, of that part of the students that do not come directly from secondary school, have at least one discontinued education in their past; the reason for this is often a lack of motivation [32]. VUC teachers use a variety of motivational strategies in their daily teaching practices to create positive learning situations. The VUC administration continuously strives to find new, motivating solutions for its students. According to a survey of VUC's upper secondary adult students, 70% of the students played games on a daily basis, 10% played 3–5 times a week and 20% never played games. As 80% of the students already had game-playing experience, it was relevant to investigate if students might be interested in using games as a means of learning.

Prerequisites for learning in the small digital games: For the small games, prerequisites for learning had to be considered for two groups: the learning game designers and the future players/learners of the learning games. Maintaining motivation of the student game designers was an important consideration; the learning game design process was therefore scaffolded in small chunks. As for the future players/learners, the learning game designers had their fellow students as targeted audience, and therefore knew them well, making it easier to design learning games for them.

2) ***Framework conditions/ learning situation.*** *Framework conditions* are factors that can present opportunities or barriers in the learning situation [31 p. 28]. A variety of framework conditions can be involved in the teaching process. Formal framework factors might include social, economic and political factors that are designed into rules and regulations. Practical factors might include available equipment, knowledge about the equipment, room conditions and time available for teaching. Softer frame factors might include individual teacher opportunities in relation to resources, methodologies, knowledge, values, personal limits or traditions and the opportunity to work together with colleagues in professional development.

Framework conditions or learning situations in the gamified learning design: In this project, the framework condition for learning was *game design as a means of learning*. Within a design thinking approach the students developed small analogue prototypes of games and transformed them into digital games. This demanded that students had access to a relevant digital game design tool as well as the opportunity to become skilled in using

this tool. Various tools were used throughout the iterations, but Scratch [56] and RGBMaker [57] were the most successful.

Framework conditions or learning situations in the small digital games: The students succeeded in creating situated learning experiences inside the small games. The players/learners could identify with an in-game character, take on an ‘apprentice’ role, and thereby learn by doing within the game [9]. The learning situations in the small games were equivalent to the game elements *action space and narrative*; and the scene was ‘set for learning’ as student game designers focused on creating narrative, character identities, events and situations that facilitated learning processes.

3) **Learning goals.** What is the objective of the teaching and learning process? The term *learning goals* refers to what students are expected to have learned through their learning activities [29]. Learning goals are tools that can be used by the teacher and students to improve teaching and learning. They should be clear, relevant, realistic and meaningful. Clear learning goals will make it easier for the student to evaluate her own learning process and work. When developing learning goals, it is important that they are made operational—that is, formed in such a way that students clearly understand what to aim for and work towards. It is important to make students familiar with the objectives. Allowing students to choose their own learning goals can be highly motivating and can make the goals more meaningful. These goals can be viewed as a contract between the student and the teacher which clarifies their respective aims for learning and teaching.

Learning goals in the gamified learning design: The cross-disciplinary learning goals for the learning design with the students involved learning subject matter in history and English as a second language. The teachers communicated these learning goals to the students and continuously returned to them during the game design process in their guiding and formative evaluative talks with the students; for example, the teachers suggested ways the students might implement learning goals into the games. Students were thus very aware of the learning goals and worked hard to reach them in this problem-based and constructionist learning design. Teachers in the third iteration of the project claimed that their students had learned as much as or more than they would have learned in a traditional learning situation [37].

Learning goals in the small digital games: In a sense, the small digital learning games had the same general learning goals as the gamified learning design, but they had individual learning goals as well, based on the specific learning goals the student teams had chosen and the way the teams managed to implement those learning goals within the games. In the third iteration, this meant that although all of the games sought to teach players/learners about the American Civil War and human rights, the potential players/learners would learn about different aspects of these subjects.

4) **Educational content.** *Content* is what the teaching and learning is about. *Content*, *curriculum* and *subject matter* all refer to those things the student must learn during the educational process; content is the means or the way to the goal. There must be a clear link between the learning objectives and the content in order for the teaching to succeed.

How the content is organised is also important. If the learning goals are known in advance, the 'content-road' to the learning objectives can be organised in accordance with the student's prerequisites and the framework conditions.

Educational content in the gamified learning design: Because the project had a problem-based pedagogical approach, students had only a brief introduction to the content. The major part of the students' learning process took place as they researched relevant content that both matched the learning goals and contributed in a meaningful way to the narrative and the learning situations in their small games. The students successfully managed to find detailed and nuanced content for the teams' individual games.

Educational content in the small digital games: The content was presented in many ways within the small games. For example, content might be introduced as direct instruction, as the context of the learning situation or as 'hints' provided in the games regarding what to do or 'listen for' while playing. Learned content might be reinforced by presenting a challenge students must overcome by using their newly acquired knowledge. Therefore, it was also crucial that the content came at the right time and place, according to the player's level of competence. The students implemented the content, and as a result, according to the student and teacher interviews, they learned the subject matter in great detail and depth.

5) ***The learning process.*** *Learning process* refers to how learning should take place. What is learning, how do we organise it and which methods and teaching principles are relevant? What responsibility does the student have in the teaching process? What is the role of the teacher? How can the student be motivated? How can a good climate for teaching and learning be created? What working methods are most appropriate in order to achieve the learning objectives? These are some of the questions the teacher must consider when designing the learning process. The teacher must consider what kind of learning activities will help the student achieve the learning goals. These activities are determined in part by the subject matter but also, to a great extent, by which pedagogical approaches and learning theories the teacher chooses to use. It is relevant to examine the learning process from the perspective of the three dimensions of learning [33]: the inner psychological process of acquisition, the interpersonal interaction level (social and situational learning processes) and the incentive dimension (dealing with motivation to learn). If our aim is to create a smooth learning process through assimilative learning processes [34], that is, by incorporating new influences into our existing knowledge structures, we should organise teaching through scaffolding in accordance with students' zones of proximal development [35] and divide instruction into meaningful units for the beginner [36].

The learning process in the gamified learning design: In the overall learning design, the facilitated problem-based learning process was developed over the three iterations. The author elected to turn the overall learning situation into a gamified learning design. This had two purposes: to create a motivating and perhaps even fun learning environment and to scaffold the teaching and learning situation very thoroughly, as neither the teachers nor the students had tried being learning game designers before. Therefore, all

assignments were explained in detail and presented in a Google Docs document shared in each team. According to the findings, activities that involved making, building or programming provided a rich context for learning, as the construction of artefacts, in this case learning games, enabled reflection and new ways of thinking.

The students learned from reflection and interaction with the tools, both individually and in collaboration with peers. In analysing students' learning trajectories within this method of learning, this study found that during the learning-game design process, students went through an iterative process consisting of six areas as they conceptualised and built the games: 1) studying learning goals, 2) researching authentic and relevant sources, 3) choosing relevant content for the story environment, 4) matching content with a storyline and learning environment in game design, 5) systems thinking—looking for cause and effect relationships and providing multiple paths, and 6) designing game mechanics, and facilitating learning and evaluation processes [37].

Other findings were that the learning design was constructed as a hierarchy supported by various learning-designer roles contained within one another [37]. In this process, the students became their own learning designers, leading their own innovative learning processes with educational technology. They also acted as learning designers for their fellow students when they worked to facilitate learning activities and learning trajectories inside the small games. The gamified learning design supported the innovative learning processes for the students. The teacher participated as an inspirational guide and contributed to the students' cognitively complex learning processes as they designed curriculum-based learning games [13, 33].

Four parallel types of processes for designing and learning supported the gamified learning design: 1) the structured game-design process, 2) concept-building processes in which prototypes served as materials for learning, 3) teaching processes in which the teacher's learning-inspired and game-inspired metaphors were used to support the learning processes in the big and small gamified learning designs, and 4) the students' individual, collaborative and motivational learning processes [38]. The teachers found it easy to support and evaluate the students' learning processes with the help of concepts and metaphors from the Smiley Model when guiding the students in their learning game development process [38]. Students initially created prototype paper games; they then created digital games. The teachers observed both individual cognitive learning processes and collaborative learning processes in the teams, and they also had formative evaluative discussions with the students.

The learning process in the small digital games: In the third iteration, the students succeeded in creating complex learning games that went beyond the level of quiz games and the cognitive complexity level of *remembrance*. The students developed learning trajectories through the games by designing the following learning opportunities into the games: Learning from conversations between teacher–learner characters (being an apprentice in the game), learning by experience, learning from direct information presented in the game, learning from just-in-time additional knowledge, learning from authentic hints and learning by *doing* in the game [39].

6) ***Evaluation/Assessment.*** A learning designer must design with evaluation in mind in order to assess whether the learner has reached the learning goal and the intended level of growth and mastery. The teacher must decide: Who should evaluate? Should the evaluation happen jointly between student and teacher? What should be evaluated? Evaluation can take place to assess the teaching process, the student's learning and the learning goals. How and when should these be evaluated? Generally, a 'diagnostic assessment' takes place at the beginning of the course to uncover the student's learning prerequisites. During teaching, a formative assessment may take place so the learning design can be adapted and shaped according to what happens during class. At the conclusion of the course, a summative assessment may take place, either as a formal assessment by means of a test or a more informal assessment with interviews and feedback [31].

Evaluation/Assessment in the gamified learning design: The teachers conducted guided formative evaluations with the teams throughout the workshops, similar to traditional problem-based learning. The students also continuously evaluated themselves, monitoring whether they were meeting their learning goals. The students found one assessment point particularly important: their assessment of whether the material they were teaching in their games was correct. They were very determined not teaching their fellow students anything wrong.

Evaluation/Assessment in the small digital games: In the small games, players/learners were evaluated by being tested on whether they had learned the presented content. Players/learners could learn/be evaluated through consequence, through stealth assessment, and by whether they had made the right choices within the game [40].

All six learning design elements are intertwined and affect each other. Therefore, all six elements should be considered when designing for learning. The project's application of these learning design elements made it possible to reflect on the various elements that were essential in developing a successful teaching and learning process.

4.2 Game Design Elements: Setting Learning into Play

According to the Smiley Model (Fig. 3) for designing learning and play, once the learning for the game has been considered and designed, the next step—the 'lower-arc' in the Smiley Model—is to use the six game elements to 'set the learning design into play' (Fig. 3) [16, 24, 41]. The six game elements are 1) game goals, 2) action space and narrative, 3) choices, 4) rules, 5) challenges and 6) feedback. Like the learning elements, each of the game elements in the design of a learning game is intertwined with the other game elements. If the experience should become playful—or *gameful*—then the game goal should differ from the learning goal. Therefore, it is important to consider what the learning goals are, what the game goals are, and how to implement the learning goals in the game. The game *mechanics*—which actions can be taken in the game, or what the player can do—help provide the structure of the game and often are where learning

elements are implemented into the game [41 p. 237]. While designing these game elements, the designers should also constantly keep in mind and design for Bruner's three motivational forces [30, see 4.3]. The six game elements involve the following:

1) **Game goals.** The game goals must be designed in a concrete way; the game's ultimate goal must be clear to the player. If there are a series of goals, these should also be understandable. The goals should be challenging but achievable, letting the player feel that he will be able to reach the goals so he does not give up; this relates to Bruner's 'feeling of competence' [30]. The goal(s) should be designed in a way that makes the player both look forward to achieving the goal and enjoy having reached the goal. If the designer has placed the goal after the appropriate level of challenge, the goal will be rewarding in itself. The designer must also balance the game's goals in the short- and long-term and let them relate to each other in a meaningful way [42]. The overall goal should be split into many small and large goals; this will help provide an overview and a sense of achieving many small successes. In this way, the player can gain ownership in relation to his success and development [43]. These goals must be linked to each other in a meaningful way so the game can be experienced as coherent [42].

Game goals in the gamified learning design: The overall goal of the gamified learning design was to create a learning game and win the big Game/gamified learning design. The game was presented as 25 levels or sub-goals, with 3–5 assignments for the teams at each level. Many gamified learning designs also encompass an overall narrative which can then create a story about a game-goal. So despite the recommendation against having identical game goals and learning goals, the game-goal in this gamified learning design was almost identical to the learning goal, except that teams could win the game by collecting the highest number of points. According to the teachers, the academically challenged students who traditionally preferred small and structured assignments, as well as other types of students who declared that they were competitive by nature, were motivated by the overall gamified learning design. Whereas students who had an easier time structuring their own learning process were more motivated by creating their own learning path, but were very engaged by creating good learning games for their fellow students.

Game goals in the small digital games: Analysis of the goals in the small games revealed three variations: 1) the goal was equivalent to the learning goal (students created a quiz game); 2) the game goal (sub-game-goal) involved playing through events in the American Civil War in order to experience the war from the viewpoint of either the North or the South; or 3) the goal was to help an enslaved person escape and become free (explorative game). These game goals were therefore dependent on the game genre and contributed to the atmosphere or type of playfulness in the game.

2) **Action space and narrative.** The action space and narrative of the game must be easy to understand and act within. The learning content should be a part of the game design, and the problem and tasks should be presented in the actual elements of the game. If the learning material is deeply embedded in the game mechanics and the game reacts as

a result of the player's actions and choices, then the player will achieve a feeling of 'learning by doing' in the game.

Action space and narrative in the gamified learning design: The action space of the gamified learning design was the classroom. The 'tools' in this space were the analogue and digital game-design materials and tutorials, as well as the Google Docs documents in which the students' assignments and points were presented.

Action space and narrative in the small digital games: Action space and narrative was the *first game element to receive attention* as the students designed their small games. As mentioned, action space relates to the framework conditions for teaching—the learning situation. Therefore, the students considered the action space/scene at the very start of the learning game design process. The scene's content would enable learning to take place; the scene was the 'workshop' (learning situation) for the apprentice/character. Because the students in the third iteration were building historical games, the game's action spaces all encompassed historical scenes, characters and narratives. According to the teachers, the students were clearly motivated by creating the games and the historical learning situations and narratives. The game design processes contributed to students' achievement of their learning goals.

3) **Choices.** The choices offered must be meaningful to the player; as she receives feedback on the wrong or right choices, she will learn in the game. The frequency of the choices and the cleverness behind the related consequences are a major component of the game's fun [42]. It is important that each decision have its own consequence; two choices should provoke two different results. Putting meaning and weight behind the choices assures that the player will experience *agency*, or the ability to act, in the game.

Choices in the gamified learning design: The students could choose to design their learning game in any way they desired. To support the students in creating effective and engaging learning games, some assignments were mandatory and some were optional; whether they were one or the other was conditioned by the rules (below). Teachers and students reported that being able to choose which assignments they preferred to solve gave students a feeling of freedom and agency that they appreciated.

Choices in the small digital games: The small games differed in how many choices the player/learner was offered in the game. Some games became quiz games (despite students being asked not to make quiz games) in which the player/learner could choose one of two answers. Other games had learners write down what they had learned in the game. Some games offered the learner the opportunity to explore, do, ask and listen inside the game, providing many options to choose from and giving the player more agency with many different consequences. Finally, some choices were not related to the learning purpose of the game but simply contributed to the game-feeling by letting the player explore and experiment within the game universe. Thus, although the choices varied from game to game, they contributed to interactivity, surprise and variation within the games.

4) **Rules.** The rules should be clear and fair. The rules determine what effect the player's choices will have. If learning is embedded within the game mechanics, the player will learn while learning the capabilities and limitations of the game's rule system [22].

Rules in the gamified learning design: Students could gain experience points (EXP) by carrying out the assignments. In the first iteration, teams were awarded special points for completing their assignments and delivering high quality results, but this point system turned out to be too complicated. In addition, the competitive students complained that the point system made them rush through the assignments in a superficial way, while the hardworking and thorough students lost the game. Based on students' suggestions, the point system was altered so that students who chose the optional, more demanding assignments could earn points and win by creating a high quality learning game. Though some students did not appreciate the EXP system, other students were amused and motivated by earning points and trying to win. All students could earn social points by either helping other groups or asking other groups for help; the findings suggest that these points may have contributed to the improved social atmosphere and higher collaboration experienced between students in these workshops as compared to more traditional instruction-based classes.

Rules in the small digital games: The small games all had individual rules. In one game, for example, players had to give the correct answer before they were given the next question. In another game, learning certain information provided in the game helped the character escape from slavery. The player/learner first had to learn how to identify a free house (two candles placed in the window). The rules were that by seeking, finding and entering the house, the character could eventually be emancipated. These were examples of rules that the player had to understand and follow in order to learn and to reach the final game-goal.

5) **Challenges.** The challenges in a learning game encompass the learning goals, the learning content and the learning activities. Challenges might include recognising patterns, learning rules, solving tasks and developing hand-eye coordination [19]. The framing of the learning goals should determine which challenges are appropriate to include to help the player meet the game's learning goals. The purpose of playing a learning game is to attain the learning goal and to master the action or understand the pattern. By playing the game successfully, the learner will automatically show her competence in overcoming the challenges, since completing the game requires the knowledge to solve the problem [44, 19]. If the player/learner finds it difficult to meet the challenge in the game, the game should provide feedback or scaffolding, breaking down the task into smaller game goals to support the player.

Challenges in the gamified learning design: Challenges were presented in all of the learning-game creation assignments. Students were challenged to take responsibility for reaching their subject matter learning goals, and they were challenged to create analogue and digital learning games. The challenges were therefore many and varied—even among the students, since they could take on different roles in the game design process [15, 37,

38, 39, 40]. This made it possible to differentiate the learning process in keeping with the students' abilities and interests.

Challenges in the small digital games: The challenges in the small games were the ways in which the games tested the competence of the players/learners. The games created in the second and third iterations succeeded in teaching the player/learner the subject matter; the player/learner was then challenged to prove his competence in the subject matter inside the game by answering something correctly (choosing the correct answer), doing something (choosing the correct action) or finding something (looking for it in the game, and from the new knowledge, knowing where to go and look and what to look for).

6) **Feedback.** The sixth game element, feedback, is crucial. Feedback lets the player/learner know if he has reached the goals and ensures that learning has occurred. In fact, feedback in the game corresponds very closely with the feedback that is needed when learning [45]. The player should also receive feedback if he does not meet the learning goal. The 'long-term feedback' given in a game should be instructive; the game can provide guidance and strategic feedback (*process feedback*, which resembles formative feedback in learning) or give information on action-based/performance-based data (*outcome feedback*), which will then lead the learner toward the learning goal [16, 46]. Furthermore, the feedback should be of such a nature that the player does not lose self-esteem. There is thus a tension between the need to provide clear performance feedback and the need to avoid damaging the student's self-esteem; rather than discouraging the player/learner, feedback should urge him to move forward with the task [47]. When developing the game, designers should work to transform the player's feeling from one of 'failing' to one of 'not having managed it yet' [43]. Reward (*extrinsic motivation*) [48, 49] is a key component in games [19] and is also a type of feedback. It is important that the player/learner is only rewarded for a real effort or achievement in the game. Rewards recognise the player for the effort she makes in the game [43] and, at the same time, give her a sense of autonomy [50]. These rewards are not just medals and earned points; they can be new opportunities or access to a new kind of task. A guiding concept when determining feedback content and strategies is that the feedback should correspond to the selected learning which has required an effort from the player, and it should relate to how the player has performed the task. Otherwise, receiving feedback will feel hollow and meaningless [16, 23, 51].

Feedback in the gamified learning design: The teacher provided formative feedback during the workshops. This feedback and guidance was developed and modified throughout the three iterations to support meaningful and deep learning processes for the students (see [38] for an elaboration of the teacher's role). The pedagogical approach was problem-based; the students were therefore assessed in formative evaluation conversations with the teacher.

Feedback in the small digital games: In the small games, feedback was presented in the form of consequences resulting from the player's choices in the game. For example, players received feedback on whether their choices were right or wrong, or feedback was

given in the form of subject matter information provided at relevant places in the game (*just-in-time learning*). Characters in explorative games could choose between different actions, not knowing which choice would move them forward in the game and be the right thing to do in the small learning situation. In those cases, the consequences served as feedback, and the players *learned by doing* in the game.

4.3 Motivational Factors in Learning

This section describes the three motivational factors illustrated below the arcs in the Smiley Model (Fig. 3) and analyses how these factors were used in the project. The Smiley Model uses Jerome Bruner's [30] concepts regarding how inner motivation is activated. These three concepts can be used to design for and analyse motivation in the game design. Bruner, an educational psychologist, took an approach to motivation based on learning theory. Bruner [30] asserted that our will to learn, or the intrinsic motivation to learn, consists of three primary underlying forces that cover basic human psychological needs.

1) **Curiosity**: the desire and freedom to explore things and the agency to decide for ourselves (we experience it as being in a playful and investigative mood). We challenge ourselves and investigate new areas in which we are not yet strong and confident. When investigating new ground—learning—we are seeking explanations for new patterns that do not seem to fit with our previous understandings [30, 33, 49]. Conversely, as adults we can sometimes find it overwhelming to have to add new knowledge to our existing knowledge; it can also be provoking to have to admit that there are areas in which we are not experts. This can result in a kind of resistance towards learning [52]. This resistance hinders the curious and open attitude and approach that welcomes new learning.

Curiosity in the gamified learning design: Using learning game design as a means of learning traditional subject matter was a new learning approach, and since many of the students were playing games as part of their daily lives, they found this teaching approach interesting to participate in. For some students, it was also challenging; there were many new elements and ways of thinking that were approached in a new way, raising concern among students about their ability to learn the curriculum. Teachers responded to this concern by continually discussing the learning goals with the students. To maintain a feeling of curiosity, it was important to let the students be free agents who could choose between various assignments and roles. Study observations revealed that the students had fun and created fun situations in their games. Fun may be difficult to design for, but it is worth paying attention to, aiming towards and valuing in a learning design, as fun is a serious design value [22].

Curiosity in the small digital games: The students used the interactive elements in the digital learning games in many creative ways. Even simple aspects such as the feedback on whether an answer was right or wrong were formulated in a variety of humorous ways; players could anticipate receiving fun feedback as they continued through the games. The

explorative games featured many built-in experiences which were designed to be activated by players/learners as they explored and made choices in the games.

2) **Competence**: the desire to show that we are independent individuals who can control and master a situation, take the initiative and develop solutions. If we are supported to take the initiative and develop solutions to our problems, we experience joy and pride. Acquiring new skills—getting control of a situation and mastering something—creates joy and pride and is motivating.

Competence in the gamified learning design: As they worked through the scaffolded assignments in the gamified learning design, the students clearly expressed and showed signs of feeling competent as they overcame areas they had never worked with before. In the first experiments, the game design tool chosen was too difficult for them, and some assignments proved to be unclear; this was adjusted in the next two iterations. In the third iteration, the students worked very hard; remarkably, they declined to take their breaks, choosing instead to focus on their projects. Though the students experienced frustrations, they overcame them, and in many periods they experienced *hard fun* [53]—the enjoyment that comes from doing challenging things, as long as they are the right things matched to the right individual.

Competence in the small digital games: A crucial consideration when designing learning games that aim to motivate the player is to create places/situations that allow the player/learner to experience her own competence. These are situations in which the learner is learning and/or is tested on her competencies and thereby experiences what she knows and to what extent. We can only design or facilitate the player's experiences indirectly [1 p. 171]; we do not know what will happen when the player actually plays the game. The student learning-game designers aimed to design the games in such a way that players would achieve a feeling of competence in all the interactions or game elements (rules, choices, challenges, feedback), as discussed in 4.2.

3) **Reciprocity**: making a difference and being an indispensable part of the community while achieving goals together with others. People like to achieve goals with others. They like being part of a 'learning community'—a community of practice [54]. Reciprocity occurs when we feel that 1) we are contributing to a joint project which makes a difference and 2) the community cannot do it without us. When collaboration succeeds, a positive feeling of belonging to the community arises. Reciprocity (also referred to as *relatedness* [48]) can be achieved through collaboration or friendly competition.

Reciprocity in the gamified learning design: According to the teachers, the students had previously experienced significant difficulties in collaborating around their traditional subject matter assignments. One of the significant findings in the third iteration of the project was that these same students, when introduced to the gamified and structured learning design, started to work together very intensely and closely. This close collaboration was still continuing two months after the experiment concluded and was a positive gain for the students. The student teams also competed against each other in a friendly way, which at times created a playful atmosphere in the class.

Reciprocity in the small digital games: Students created ‘small communities of learning’ in the games; for example, a teacher-character might teach a student-character within the game, or characters might help each other inside the game. These collaborative situations were created to engage the player in the learning situation, to embody and exemplify the learning goals and content and to facilitate the learning processes of the player/learner. In addition to their learning possibilities, many of the situations and conversations inside the games had humorous and emotionally appealing aspects designed to engage the player/learner of the games.

4.4 Applying the Smiley Model: Further Considerations

Supported by the learning game design documents, the teachers used concepts from the Smiley Model to discuss and guide the students’ game development. Many of the elements in the Smiley Model were connected and intertwined, so although they are described one at a time in this article, the research suggests that students were actually designing multiple elements at the same time. The order in which the various elements were introduced was found to be of importance. In the small digital games, for example, the action scene, which encompasses the design of the learning situations, the narrative, and the character identities, formed the basis for the rest of the game design process, and therefore naturally always came first.

The students were challenged to create games that went beyond the ‘quiz level’. For example, they were encouraged to consider creating cause-and-effect situations and to provide multiple learning paths for their players in the small games. These considerations contributed to more complex and information-rich games, leading to more cognitively complex learning experiences for the students.

According to the teachers involved in this project, one of the project’s valuable results was a better social climate among the students. Students were observed to work in close collaboration and generally appeared to have more fun than during previous, traditional more instructional lessons. The students participated as players in the gamified learning design, team against team, but they also experimented with and discussed/peer reviewed the other teams’ games and learned in this process [15, 24, 41].

5 Conclusion

To create new knowledge about what enables students’ motivation to learn and how that motivation can be supported in the educational system, the aim of this study was to investigate whether it was possible to create and use a framework that intertwined learning and play in a meaningful and successful way. Therefore, this project investigated whether the Smiley Model (Fig. 3) could be used as a framework to support students in acquiring new knowledge and skills and to support the creation of playful, engaging and

motivating learning experiences. The Smiley Model was applied as a framework used in the creation of an overall gamified learning design for the class; the model was also used to support the students' design processes as they created small digital learning games. The purpose of the gamified learning design was to create meaningful and cognitively complex learning processes for the student game designers.

In the project the Smiley Model, a framework for learning design, game design and motivational factors was thus used as a model to inspire the students' written *learning game design assignments*. The teachers also used the concepts and metaphors from the Smiley Model to guide and evaluate the students' learning processes as they participated in the gamified learning design and created small learning games.

Cognitive complex learning processes: The analysis found that the students showed signs of individual as well as collaborative learning processes. The students became aware of and took responsibility for achieving their own learning goals, and they worked hard at reaching those goals in this problem-based and constructionist learning design. In the process of designing and implementing learning situations into the games, the students researched the subject matter, located detailed and nuanced content and used it to create historically relevant narratives. Students thus learned about the subject matter in great detail and depth; as a result, they reached cognitively complex levels of understanding. According to the teachers' formative assessments, when students participated in the gamified learning design and designed small learning games, they learned at least as much as or more than they would have with more traditional instructional learning design.

Playful and motivating learning processes: The students were motivated by creating the games and the historical learning situations and narratives. The students worked hard and had fun. Some of the students were amused and motivated by earning points for solving the assignments in the overall gamified learning design, while other students preferred working without extrinsic motivation and focused on creating their own learning paths. Teachers found that it was possible to differentiate the learning process and align it with the students' abilities and interests, and this gave the students a feeling of freedom and agency. Generally, this learning approach contributed to a better social atmosphere and a higher level of collaboration among students who had previously had difficulties participating in and contributing to collaborative learning processes.

This project found the Smiley Model highly useful in scaffolding the learning game design process in the small digital games and in the overall gamified learning design. The model's elements proved effective and meaningful for supporting the creation of engaging learning experiences for students in the current learning situation. The model's elements were thus used to create a learning design that combined learning and play and enabled complex cognitive learning processes in a meaningful and successful way. It is, however, only a model, and when a model is implemented it is used in a specific learning context, with specific learning goals, actors and materials—a complex setting. Based on previous research [15, 17, 41, 38], creating a gamified and engaging learning design is a complex process, and there is still more to learn before this framework and learning design are

ready to pass on to novice learning game designers outside of this research project. The direction of future research, studying how students can use game design as a means of learning will also involve the Smiley Model. We expect the learning process will be fun as we continue to follow this path - also outside of the research project.

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